Muon Neutrino Disappearance in the Short-Baseline Neutrino Program

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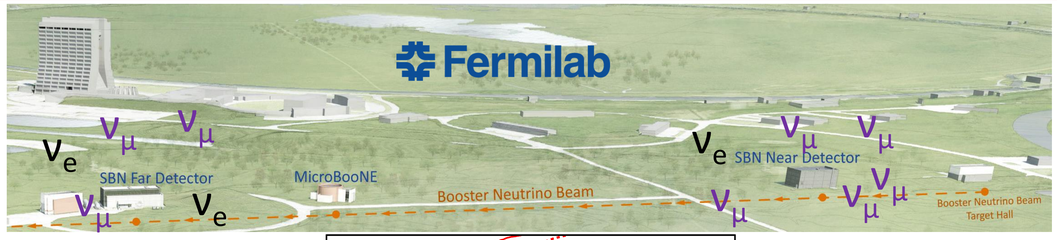
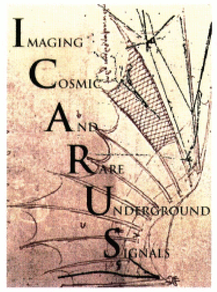
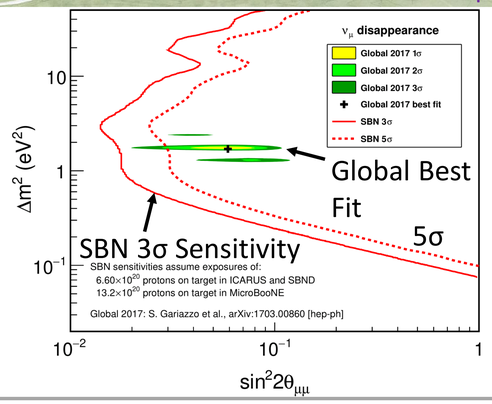
Understanding the Short-Baseline Anomaly

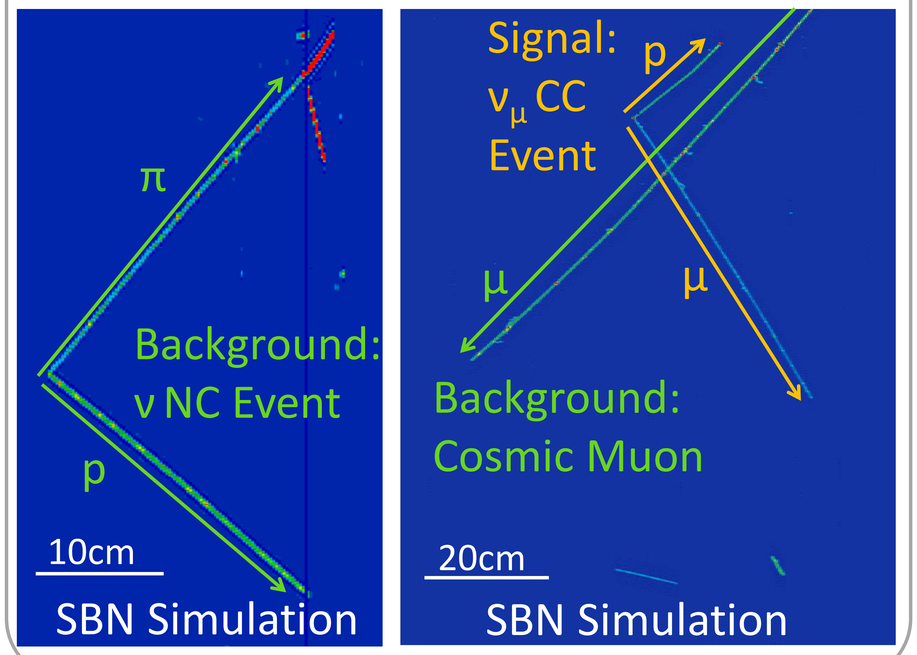
- The short-baseline experiments LSND and MiniBooNE observed electron neutrino appearance possibly consistent with a new ~1eV sterile neutrino
- Sensitive muon neutrino disappearance studies have shown null results
- **SBN**: upcoming Fermilab program searching for **both** ν_μ disappearance and ν_e appearance in its ν_μ beam (L/E ~ 1km/1Gev)





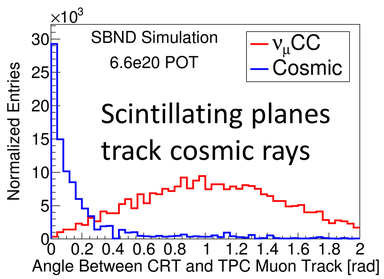


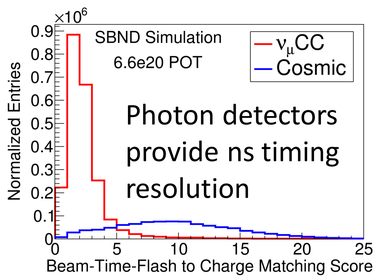
SBN Detectors: LArTPC Imaging

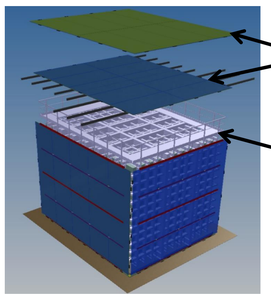


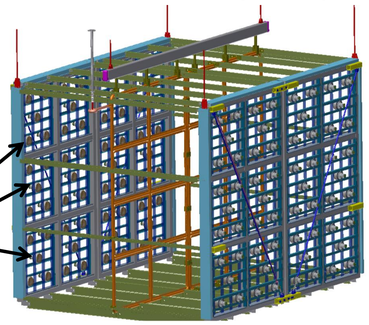
Event Selection

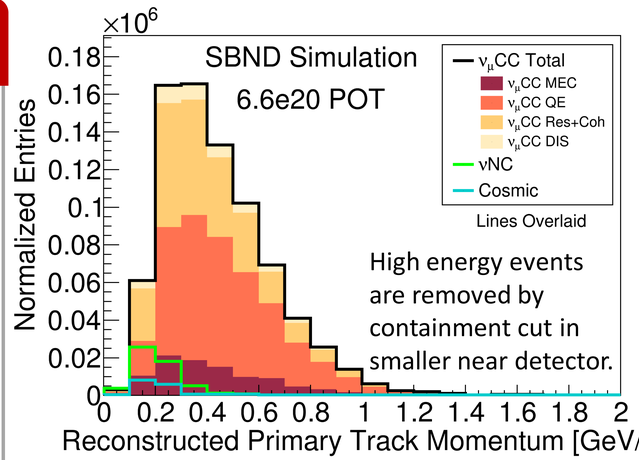
Cosmic Rejection

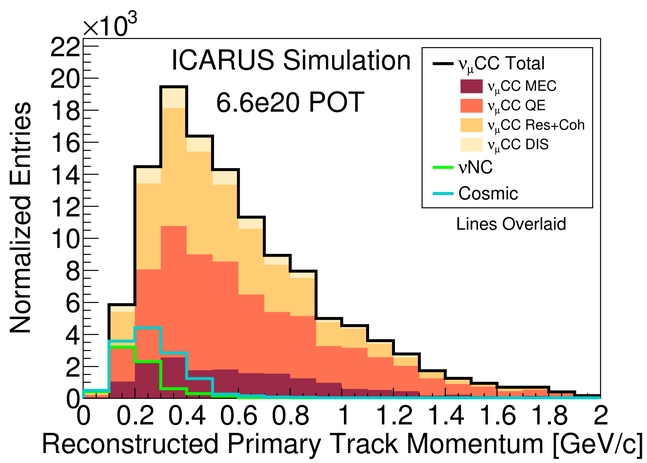






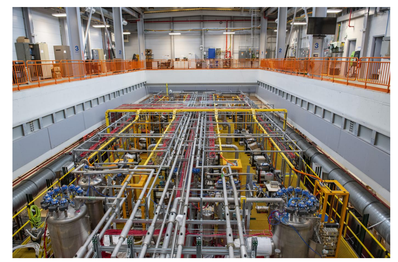


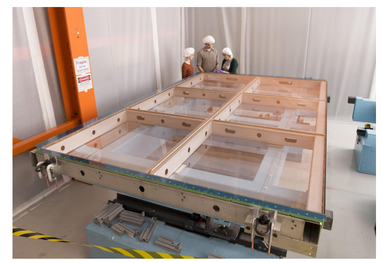




Outlook

- This analysis leverages simulations of the SBN detectors to select a pure ν_μ CC sample against the large cosmic background at the earth's surface
- Going forward – continue to develop ν_μ CC event selection ahead of data taking:
  - Refine cosmic rejection
  - Reconstruct hadronic final state and neutrino energy
- Incorporate lessons from data taking – ICARUS starts in 2020, SBND in 2022 – towards a future ν_μ disappearance result in SBN





SBN Review: arXiv:1903.04608
SBN Proposal: arXiv:1503.01520

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